

DISCUSSION OF THE AMENDMENT

Claims 1-2, 4, 7-13, 18-19, 26, 28-29 and 31 are active in the present application. Claims 3, 5-6, 14-17, 20-25, 27 and 30 are canceled claims. Claims 8-11 are currently withdrawn from active prosecution. Independent Claim 1 is amended herein to include the subject matter of previously pending Claim 5.

No new matter is added.

REMARKS

The Office Action maintains the rejections of the previously pending claims as obvious over the combination of Tsuji (U.S. 6,524,668), Sarno (U.S. 4,403,955), and Hill (U.S. 2,947,114). Applicants submit that the Office failed to give full consideration to Applicants' arguments and improperly failed to consider to the prior art as a whole when judging the patentability of the presently claimed invention.

Applicants submit that the Office's assertion that it would be obvious to modify the outer surface of the Tsuji crucible to arrive at the presently claimed invention makes no sense. The crucible of Tsuji is a composite of an inner quartz glass crucible and an outer layer of carbonaceous material. The quartz glass inner layer is integrally formed with the outer layer of carbonaceous material. This characterization of the Tsuji crucible is explicitly disclosed in the patent:

The composite crucible is characterized in that a carbonaceous material as an outer layer and a quartz glass as an inner layer are integrally formed.

See the Abstract of Tsuji.

The Tsuji crucible is formed by a rotating molding method in which quartz powder is deposited on an inner layer of a rotating carbon crucible which is subsequently heated by arc discharge to fuse the quartz powder and form the quartz glass crucible (see column 5, lines 24-43 of Tsuji). The Tsuji quartz crucible is directly bonded, e.g. fused, to the surface of the carbonaceous material which forms the outer layer of the Tsuji composite crucible.

Applicants submit that is readily evident to those of ordinary skill in the art that in order to modify the quartz crucible of Tsuji it would be necessary to first remove the outer layer of carbonaceous material to expose the outer surface of the quartz crucible. Such a modification of the Tsuji composite crucible is contradictory to the disclosure of the Tsuji patent. The carbonaceous materials of the Tsuji composite crucible are described as having

characteristics such that they “are not peeled off” by change in temperature (see column 3, lines 60-62). The carbonaceous layer of the Tsuji composite crucible derives its advantageous properties, e.g., resistance to deformation, stability, thermal conductivity smoothness, to the composite structure. Removing the carbonaceous layer from the Tsuji quartz crucible would deprive the Tsuji composite crucible of its advantages and make it unsuited for its intended use. Importantly, removal of the carbonaceous layer would disrupt the integral connection between the quartz and the carbonaceous material such that “temporarily” removing the quartz crucible from the carbonaceous layer is likewise not practical.

The Office appears to be of the belief that those of ordinary skill in the art would be motivated to essentially destroy the composite crucible of Tsuji such that the exterior surface of the quartz crucible could be modified. It simply makes no sense to assert that one of ordinary skill in the art would destroy the Tsuji composite crucible to modify the exterior surface of the Tsuji quartz crucible in view of the fact that such a modification would disrupt the integral bond between the carbonaceous material and the quartz and entirely deprive the Tsuji composite crucible of its advantageous properties.

Applicants draw the Office’s attention to M.P.E.P. §2143.01(V) which makes it clear that disruption of the integral quartz-carbonaceous material bond of the Tsuji composite crucible makes no legal sense:

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.

The primary reference relied on by the Office is directly contradictory to the Office’s allegations of obviousness and thus the rejection should be withdrawn.

In the Amendment filed in the present application on January 22, 2008, Applicants pointed out that Hill includes disclosure that is directly contradictory to any combination with

Tsuji. The Office responded to Applicants' arguments by stating that the Office did not rely on that disclosure of Hill which is contradictory to the combination put forth by the Office. Obviousness must be based upon what the prior art teaches as a whole. The Office may not selectively take a portion of a prior art reference in total ignorance of the remaining disclosure. As explained by Applicants on page 9 of the January 22nd Amendment, Hill expressly excludes silica compound-containing crucibles (see column 2, lines 26-27 of Hill). The Office provides absolutely no explanation whatsoever why one of ordinary skill in the art would ignore such directly contradictory disclosure.

Applicants thus further traverse the rejection in view of the fact that the Office failed to give proper and appropriate consideration to Applicants' arguments put forth in the January 22, 2008 Amendment.

Moreover, even if Hill discloses the use of sandblasting to modify a surface which is placed in contact with a carbonaceous outer layer, Applicants point out that the thus-sandblasted surface is subsequently coated with a fused oxide before being subsequently nested in a carbonaceous material. This aspect of Hill is disclosed in column 3:

The crucible 4 is advantageously fabricated by forming a thin cup-shaped liner 5 of a noble metal and another similarly shaped base metal member 6 dimensioned to receive the liner 5 with very little clearance therebetween. Having provided the two cuts 5 and 6, either the outer surface of the inner cup 5 or the inner surface of the outer cup 6, or both, are roughened, as by sandblasting, and one or both of the cups are coated with the fused oxide in a manner described with respect to Figure 1.

After coating, the two cuts are nested together with a snug fit.

See column 3, lines 6-16 of Hill.

Applicants submit that any roughening of the metal surface of Hill is necessarily disrupted by the application of a fused metal oxide layer. While the Office appears to assert that the roughened surface of the quartz glass crucible of the present claims is obvious in

view of the roughening described by Hill, Applicants point out that Hill actually teaches that the roughened surface does not contact an outer layer of carbonaceous material but instead is covered with a metal oxide layer.

In fact, the above-quoted disclosure of Hill makes it clear that there can be no improved contact between the inner and outer surfaces of the Hill metal crucible and carbonaceous material due to the sandblasting. The Office's assertion that the sandblasting of Hill is carried out to improve contact between the surface of the metal crucible and the outer carbonaceous material during nesting simply makes no sense and is contradictory to the explicit disclosure of Hill.

Thus, the combination of Tsuji with Hill is further not supportable and the rejection should be withdrawn.

With regard to the combination of Tsuji with Sarno, the Office asserts that the Tsuji crucible would have the surface properties of Sarno (see the paragraph bridging pages 5 and 6 of the September 26, 2007 Office Action).

Applicants submit that the surface properties disclosed in Sarno do not suggest the surface properties of the present claims. The roughness of the outer surface of the Sarno crucible is attributable to the presence of unfused sand (see the last paragraph on page 4 of the September 26, 2007 Office Action). The surface of the Sarno crucible is thus one that has not yet been finished. The rough, unfinished surface of Sarno is in no way suggestive of the surface recited in the present claims which has a particular number of projections having a height of 0.1 mm per unit area.

Applicants disclose the following with respect to the presence of unfused glass on the outer surface of a crucible:

The silica glass crucible used for pulling up the single crystal silicon has been mainly produced by the method, heating and fusing the quartz powder layer stored in the inner surface of a rotational mold and vitrifying it. As for the silica glass

crucible, the un-melted quartz powder is adhered on the outer surface of the crucible and immediately after producing said silica glass crucible in an arc furnace. Although aid un-melted quartz powder can be removed with high-pressure water, the projections having the height of about 0.1 mm or more exist so much on the outer surface of the crucible. From this reason, it can be understood clearly that the adhesability of the silica glass crucible with the carbon susceptor is low.

See the first full paragraph on page 4 of the present specification.

Applicants submit that the present specification makes it abundantly clear that the surface of the generic crucible has made from quartz glass and metals cannot meet the requirements of the present claims with respect to the number of projections per unit area. In fact, the present specification discloses that using a conventional rotational molding process (e.g., such as the process of Hill) to prepare a crucible provides a crucible having an outer layer to which quartz powder is adhered to the extent that projections having a height of 0.1 mm or more “exist so much on the outer surface of the crucible.”

While the Office asserts in paragraph no. 6 on page 4 of the March 26th Office Action that Applicants are claiming a silica glass having a roughened surface just like that of Sarno, Applicants submit that such an assertion is not correct as evidenced by the above-quoted text of the specification. Moreover, there is no evidence of record that any projections caused by the presence of unfused quartz or silica on the surface of a crucible made by rotational molding would have less than five projections of a height of 0.1 mm or more per unit area.

For the reasons discussed above in detail, Applicants submit that the rejections are not supportable and should be withdrawn.

With respect to the subject matter of Claim 7, Applicants point out that Claim 7 shares some limitations with Claim 1 critical to the patentability of the claimed invention and, upon determining the subject matter of Claim 1 allowable, the Office should also allow Claim 7 over the art of record.

The January 22nd Amendment included further arguments pointing out why those of ordinary skill in the art would not combine Sarno with Tsuji or Hill to arrive at the presently claimed invention. The Office Action of March 26, 2008 appears to have given these arguments no consideration. These arguments are reproduced below. Applicants request the Office give full consideration to the following arguments in the next communication from the Office.

It appears that the Office is rationalizing that one of ordinary skill in the art would arrive at the presently claimed invention by modifying the surface of the silica glass crucible of the prior art. However, this is directly contradictory to the teachings of Sarno where, at best, it is taught that the surface roughness of the glass crucible is accommodated by changing the surface roughness properties of the carbon receptacle, not the glass crucible:

The segmented receptacle 10 [i.e., the graphite portion of the Sarno device] can have its segments 11 adjusted to accommodate any roughness, or unevenness of the crucible 12 [i.e., the prior art quartz crucible] without creating stress points that may cause breakage of both the crucible 12 and the receptacle 10 during a normal melt process in growing crystals.

See column 3, lines 36-41 of Sarno (underlining added).

Applicants submit that Sarno's disclosure that the roughness of a graphite portion of a crucible can be modified is contradictory to the Office's assertion that the presently claimed invention is obvious because Hill discloses sandblasting a crucible surface. Sarno is contradictory to Hill. One reference discloses surface roughening of the outer carbonaceous material whereas the other reference discloses sandblasting a crucible surface. Such disclosure is contradictory and far from suggesting the presently claimed invention includes disclosure that is contradictory.

For the reasons discussed above in detail, Applicants submit the rejection of the claims is not supportable and should be withdrawn. Applicants request the mailing of a Notice of Allowance acknowledging the patentability of the presently claimed subject matter.

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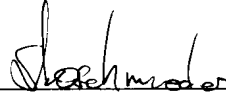
Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon



Stefan U. Koschmieder, Ph.D.
Registration No. 50,238